

September 25, 1998

Reply to  
Attn of: ECL-116

MEMORANDUM

Subject: Five-Year Review for Western Processing NPL Site

To: Randall F. Smith, Director  
Office of Environmental Cleanup

From: Lee Marshall, Project Manager  
Site Cleanup Unit #3

Through: Catherine Krueger, Unit Manager, SCU #3

CC: Beverly Gaines, Five-Year Review Coordinator, ECL

Attached is the Five-Year Review Report for the Western Processing Superfund Site located in Kent, Washington. This is a Policy Review for this site.

A data report review and a site inspection were done as part of this review. Based on this review, the remedial actions that are being completed as designed and they are functioning as designed. The site remains protective of human health and the environment.

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# **FIVE-YEAR REVIEW WESTERN PROCESSING SUPERFUND SITE KENT, WASHINGTON**

## **I. PURPOSE OF THE FIVE-YEAR REVIEW**

Region X of the United States Environmental Protection Agency (EPA) has conducted a Five-Year Review of the **Western Processing Superfund Site** (the Site), and prepared this report consistent with the requirements of Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Section 300.430(f)(4)(ii) of the National Contingency Plan (NCP).

The purpose of a Five-Year Review is to ensure that a remedial action remains protective of public health and the environment and is functioning as designed. This review (Type Ia) is applicable to a site at which response is ongoing.

This Five-Year Review was conducted pursuant to the Office of Solid Waste and Emergency Response (OSWER) Directives 9355.7-02 [May 1991], 9355.7-02A [July 1994], and 9355.7-03A [December 1995]. This Five-Year Review is consistent with these OSWER Guidance documents and is the second Five-Year Review conducted for the Site. The first Five-Year Review was completed with a Declaration (determination of protectiveness) from R. Smith (Director, Hazardous Waste Division) to D. Rasmussen (Regional Administrator) dated January 4, 1993.

The remedy was selected prior to passage of the Superfund Amendments and Reauthorization Act (pre-SARA) and that the remedy will not allow unlimited use and unrestricted exposure, and thus this is a policy Five-Year Review. Although, a substantial amount of remediation has been completed at the site, numerous remedial activities remain ongoing. EPA and Washington State Department of Ecology (WDOE), referred to as the Governments in Site-related documents, have continued to conduct oversight, but at a reduced rate, by attending routine biweekly meetings on-site and review of site activities through data/ document reviews and unannounced field inspections. The site file includes a substantial record of the documentation of Site remedial activities.

## **II. SITE LOCATION AND DESCRIPTION**

The Western Processing Company, Inc., operated from 1961 to 1983 on a 13-acre parcel of land approximately two miles north of the city center of Kent, Washington in the Kent (Green River) Valley

(Figure 1). The area was a former farming region developed into a light industrial/commercial area. The area to the north is undeveloped. East of the Site lies the Interurban Trail used by walkers and bicyclists and a railroad drainage ditch (East Drain). The area south of the Site has been developed for light industry. The Site is bounded on the west by Mill Creek, which flows in a northerly direction into the Black River, a tributary of the Green River, which becomes the Duwamish River before ultimately emptying into Puget Sound at Seattle. The Site is located outside the 100-year flood plain over an alluvial shallow aquifer, with the groundwater table at 5 to 10 feet below ground surface (bgs). There are no wells currently used for drinking water in the shallow aquifer within a one-mile radius of the site.

Background water quality of the shallow aquifer does not meet current drinking water standards, primarily for inorganic compounds. The city of Kent (pop. 71,610), of which the Site is a part, obtains its drinking water from a much deeper, hydraulically isolated artesian aquifer more than a mile southeast (hydraulically upgradient) of the Site.

Three major geologic units comprise the hydrogeologic system in the vicinity of the Site. These units comprise the White River Alluvium, the valley fill deposits that occur throughout the Kent Valley and beneath the Site. Alluvial fill consists primarily of sand, silt, and clay with occasional layers of sandy gravel. White River Alluvium is not considered to be a major drinking water source due to naturally occurring poor water quality. Groundwater is encountered at 5 to 10 feet bgs. Shallow groundwater (Zone A [shallow aquifer in a complex sequence of discontinuous interbedded silt, sand, and clay lenses to a depth of 40 feet bgs]) flows northwest from the site and discharges into Mill Creek. The deeper aquifer (Zone B [a fairly continuous fine to medium sand with intermittent silty zones existing below 40 feet extends to a depth of 80 feet bgs]) begins approximately 40 feet bgs. Groundwater in this unit flows northwest also, but generally passes below Mill Creek. Contaminants in Zone B were transported downgradient of the Site and Mill Creek; contaminants in Zone A migrated to Mill Creek prior to the installation of a slurry wall around the Site. A third groundwater zone, Zone C, extends from about 80 to 120 feet bgs and has not been impacted by Site activities.

Originally, Western Processing was a reprocessor of animal by-products and brewer's yeast. Subsequently, the business expanded to recycle, reclaim, treat, and dispose/bury/store many different types of industrial wastes. Over 300 businesses, including some of the Pacific Northwest's largest industries, had contracts with Western Processing to handle their wastes. Processes at the Site included the recovery of metals from sludges and liquid wastes; spent solvent recovery; reclamation of caustics, flue ash, and ferrous sulfide; reprocessing pickle liquor; electrolytic destruction of cyanides; chemical recombination to produce zinc chloride and lead chromate; and waste oil reclamation. Operations ceased in 1983 by order of the EPA.

### **III. SITE HISTORY**

#### **A) Early Investigations**

Following much attention to the Western Processing facility by many local agencies in the 1970s and early 1980s, the U.S. Environmental Protection Agency (EPA) inspected the facility in March 1981 to determine compliance with the then new Resource Conservation and Recovery Act (RCRA) regulations. In August 1982, EPA issued a RCRA 3013 order requiring Site owners/operators to investigate contamination in soil, surface water, and groundwater. Due to

failure of the owners/operators to comply, EPA undertook the investigation in September 1982. Analysis of over 160 soil and groundwater samples confirmed that hazardous substances had been released into the environment, had contaminated the shallow aquifer, and had caused widespread contamination of soils at the Site.

#### **B) Early Actions**

In April 1983, EPA issued a CERCLA Section 106 order requiring the owners/operators to cease operations immediately and to provide assurances that they would conduct a cleanup. When these assurances were not obtained, EPA used Superfund money to conduct an immediate removal operation to stabilize the Site. Work began in late April 1983 and was completed in July 1983. Over 1,900 cubic yards of solids/sludges and 930,000 gallons of waste liquids and hazardous substances were removed from the Site. The Western Processing facility was permanently closed by court order in July 1983 and was listed on EPA's National Priorities List in September 1983.

Using state funds, the Washington Department of Ecology (Ecology) implemented storm water control measures at the site in the fall of 1983.

#### **C) Surface Cleanup**

The Focused Feasibility Study for Surface Cleanup was published in June 1984. Under a Consent Decree, a group of over 190 Potentially Responsible Parties (PRPs), currently referred to as the Western Processing Trust Fund (Trust), undertook the surface cleanup, designated Phase I of the remediation, in July 1984, at a cost of over \$10 million. Over 2,400 truckloads of chemical waste and contaminated soil and debris were removed from the Site. Once all surface structures (buildings, tanks, impoundments, and waste piles) were cleared from the Site, the site was graded to prevent Site stormwater runoff, a plastic-lined pond was constructed to contain collected storm water, and a portable treatment plant was brought on site to treat the water.

Surface cleanup was completed in November 1984, with the exception of a dioxin-contaminated oily liquid discovered in one storage tank. No other dioxin contamination was found on site. This liquid was drummed and placed in plastic-lined trailers on the Site. Numerous attempts were made to arrange for disposal of this material, primarily through incineration at off-site locations. However, public and news-media reaction prevented this method of disposal. Finally, in 1986, after a two-year search for disposal alternatives, the Trust had the dioxin destroyed by successfully treating approximately 6,000 gallons of dioxin-contaminated liquid on site with the KPEG (potassium hydroxide, polyethylene glycol) mobile chemical dechlorination process. Residual material from the treatment process was shipped to Chemical Waste Management's SCA incinerator in Chicago.

#### **D) Remedial Planning Activities**

EPA's phased Remedial Investigation/Feasibility Study (RI/FS) work, which began during the summer of 1983 and proceeded simultaneously with the surface cleanup, added to the

information obtained from the study following the RCRA 3013 order. Over 90 of EPA's 126 priority pollutants were found in soil, groundwater, and surface water, with heavy metals, polychlorinated biphenyls (PCBs), phenols, and volatile organic compounds (VOCs) being the predominant contaminants. Over 95% of the contamination was determined to be in the uppermost fifteen feet of soil. Groundwater contamination for the most part was concentrated from the water table to approximately 30 feet bgs (i.e., within Zone A). Extremely high concentrations of contaminants were found in this shallow groundwater with maximum detected concentrations of up to 510,000 micrograms/kilogram ( $\mu\text{g}/\text{kg}$ ; parts per billion [ppb]) of zinc, up to 5,400,000 ppb of total semivolatile organic compounds, and up to 1,346,000 ppb of total volatile organic compounds (VOCs).

In March 1985, the complete RI/FS was released to the public. A series of four public meetings/workshops was held at Kent City Hall. By the second meeting, virtually all attendees were parties with financial interests in the cleanup. Alternatives involving excavation and off-site disposal with groundwater pumping appeared to be favored.

An intensive soil and subsurface waste sampling program was conducted by the Trust in the fall of 1986 to obtain pre-design information for excavation of the most highly contaminated subsurface wastes. During that test program, concentrations of metals in soils were detected at up to approximately 141,000 milligrams/kilogram ( $\text{mg}/\text{kg}$ ; parts per million [ppm]) of lead; 10,000 ppm of PCBs; 53,000 ppm of total polycyclic aromatic hydrocarbons (PAHs); and 580 ppm of individual (e.g., trichloroethene) VOCs. Contamination had not been detected beyond a depth of about 70 feet bgs. Off-property surface soils analysis indicated the presence of metals and organic compounds, which may have been transported off site by wind.

Site shallow (Zone A) groundwater flows to the northwest into Mill Creek. The RI/FS indicated that, conceptually, groundwater is captured to a depth of approximately 50 to 60 feet below grade, i.e., Mill Creek acts as a hydraulic barrier for the flow of shallow contaminated and deeper, less contaminated groundwater. Groundwater not subject to capture by Mill Creek (also flowing to the northwest) became known as the "regional groundwater." The "capture" effect of Mill Creek on site groundwater produced the initial belief that contaminated groundwater was unlikely to migrate beyond the creek.

Later installation of additional monitoring wells west of Mill Creek led to a Supplementary Remedial Investigation (SRI). The SRI, resulting in a July 1986 report, revealed that a plume identified at the time as trans-1,2-dichloroethene (referred to as the trans plume) had migrated under Mill Creek and was detected in wells west of the creek.

#### **E) Record-of-Decision (ROD)**

On September 28, 1985, the EPA Regional Administrator approved a ROD requiring the following remedial objectives/major cleanup elements:

1. Conduct extensive soil and subsurface waste sampling program, on- and off-site property;

2. Excavation and off-site disposal of the most-highly contaminated soils and non-soil material;
3. Elimination of direct contact threats in nearby off-property areas by excavation of all soils exceeding the acceptable daily intake (ADI) level or the  $1 \times 10^{-5}$  (1 in 100,000) excess cancer risk level and by covering remaining soils having above background concentrations of priority pollutants;
4. Construction of a shallow groundwater extraction system; and operation, for a minimum of 5 to 7 years,
5. Construction, operation, and maintenance of a groundwater treatment plant;
6. Construction, operation, and maintenance of a stormwater control system;
7. Excavation of contaminated Mill Creek and East Drain sediments which may have been affected by Western Processing;
8. Attainment of the Mill Creek performance standard, identified as the ambient water quality criteria for aquatic organisms or the upstream background, and excavation of contaminated Mill Creek sediments;
9. Extensive monitoring of Mill Creek, the East Drain, groundwater, and the groundwater extraction/treatment system performance;
10. Construction and maintenance of a RCRA consistent cap over Area I after pumping is completed;
11. Long-term surface water and groundwater monitoring;
12. Perform conditionally required actions if the performance standards are not achieved or if it appears that more than 20 years of groundwater extraction will be necessary; and
13. Apply institutional controls, such as deed restrictions, as needed.

An amended ROD was signed on September 4, 1986. Essentially, it required remediation (construction and operation of a groundwater extraction and treatment system) of the trans plume which had migrated off the facility and was detected just west of Mill Creek (Figure 3) during the SRI. It was later determined that what was originally identified as trans-1,2-dichloroethene was, in fact, a chemically similar compound, cis-1,2 dichloroethene.

**F) Consent Decree**

After the September 1985 signing of the original ROD, EPA had extensive negotiations with the PRPs and began actions to conduct a Fund-lead cleanup. However, in 1986 individual PRPs, precursors to the Trust, signed the Phase II Consent Decree for the subsurface cleanup described in the ROD. Following a public comment period, the decree was entered by the court in April 1987.

#### **G) Subsurface Cleanup**

In the fall of 1986, the Trust retained HDR Infrastructures to conduct the intensive soil and soil/waste sampling program and geophysical investigation. An on-site lab was set up for fast sample turnaround. Over 1,500 soil and waste samples were taken and analyzed over a four-month period. This data was used later to determine the limits of excavation of on-site subsurface specific wastes and off-property contaminated soils.

In January 1987, the Trust selected Chemical Waste Management (later known as OHM Remediation Services Corp and currently as OHM/IT) as prime contractor, with Canonic Environmental and HDR Infrastructures as subcontractors, to conduct the Phase II subsurface cleanup at a cost then estimated at \$40 million. The Trust submitted work plans for the remedial action, which were approved by EPA and Ecology. Activities were conducted consistent with the Consent Decree, the NCP, and other state and local requirements.

Subsurface cleanup began on a fast-track management schedule during which design and construction proceeded simultaneously. In the summer of 1987, construction activities began which included: excavating over 20,000 cubic yards of highly contaminated soil and sludge, installing two extraction and treatment systems, and engineering a slurry wall to enclose the Site. Groundwater extraction and treatment began in October 1988. During the summer and fall of 1987, approximately 25,600 cubic yards of subsurface soils and wastes were excavated and hauled to the Arlington, Oregon, Class I RCRA landfill. This amount was substantially in excess of the 10,000 cubic yards required under the Consent Decree.

#### **H) Groundwater Cleanup**

Installation of 54 new monitoring wells to be used in the long-term groundwater monitoring program occurred in late 1987 and early 1988. Figure 2 shows the location of all wells currently used to monitor water quality. Figure 3 shows the location of all wells and piezometers currently used to determine quarterly groundwater elevations. Implementation of the monitoring program, including Mill Creek/East Drain monitoring, began in January 1988. The PRPs chose to construct an on-site lab, comparable to an EPA Contract Laboratory Program (CLP) lab and dedicated to analyzing Western Processing samples, rather than send samples off site. Construction of the lab started in August 1987 and was completed in January 1988. Peak load for the lab was expected to be over 9,000 samples analyzed per year from the Western Processing site. Capacity was later increased to more than 11,000 site-specific samples per year.

Construction of the shallow groundwater extraction and infiltration system and the trans plume extraction system began in January 1988 and was completed in May 1988. In addition, seven "barrier" monitoring wells were installed west of Mill Creek.

Remedial systems at the site originally included an on-site extraction and treatment system, an off-site extraction and treatment system, and a slurry wall that enclosed the 14.5-acre site. The on-site extraction system, which operated from 1988 until 1997, consisted of 210 (220 after 1992) vacuum-operated recovery well points to 30 feet bgs and 13,000 feet of infiltration trenches. The objective of the on-site extraction system was to create and sustain a net inward flow of groundwater at the perimeter of the Site and a net upward flow of water within the slurry wall. An infiltration system (soil flushing) placed in shallow on-site soils within the slurry wall was designed to flush contaminants out. During later years of extraction system operation, several well points were used as recharge wells to enable additional clean water to be infiltrated below the shallow silt layer that impeded infiltration from the site surface.

The soil-flushing system was designed to expedite leaching of contaminants from the shallow soils. The well-point system was designed to offer flexibility and lower pumped volume. Header pipes and valves at the top of each well could be used to select specific flow rates from seven cells in the system.

The original groundwater treatment plant was completed in July 1988, after approximately four months of construction. It was designed with two major components: air stripping for VOCs, followed by treatment for metals and semivolatile organic compounds. Air stripper operations began in August 1988, with thermally regenerating carbon adsorption units to capture vapor-phase contaminants. After processing by the two treatment systems, extracted groundwater was discharged to METRO (currently the KCIW [King County Industrial Waste Program]), the local POTW (publicly owned treatment works), or reinjected into the ground through the infiltration system.

The original treatment system for groundwater derived from the original well-point extraction system included stripping of VOCs, followed by oxidation of phenolic compounds with hydrogen peroxide, reduction of hexavalent chromium to the trivalent form, pH adjustment, metals precipitation, and carbon polishing.

Because of severe fouling of the on-site stripping tower by inorganic precipitates, the treatment sequence was modified in September 1989 to provide metals precipitation before stripping of VOCs. After 1989, phenol oxidation and hexavalent chromium reduction were discontinued. Liquid-phase activated carbon filters were used to remove oxazolidinone from treated water before discharge to the POTW.

The final major element of the cleanup, a field modification that supplemented the remedial action described in the ROD and the Amended ROD, was the installation of a 4,400 foot long slurry wall. The wall, which surrounds the site was started in May and completed in October 1988. The slurry wall serves to contain contaminated Site groundwater during pumping and increases efficiency of the pumping effort.



The slurry wall, which is approximately 40 feet deep and laterally confines the contaminants remaining on site to the site boundaries, enhances the groundwater extraction process. The soil-bentonite wall was installed using a backhoe and bucket excavator.

The trans plume extraction system consists of three deep wells (trans wells) screened between 40 and 70 feet bgs. The Consent Decree required overlapping zones of influence for these extraction wells. A capture zone analysis confirmed that the trans plume extraction wells effectively captured the plume and was adequately containing the contamination in Zone B groundwater. Water extracted from the off-site trans wells was directed to a separate treatment system consisting of a sand filter bed and an air stripper. Effluent from this system was reinjected to the infiltration gallery or discharged to the POTW.

Contaminant concentrations in groundwater and water levels are monitored using a system of 51 monitoring wells and 28 piezometers located on and off site in both Zone A and Zone B (Figures 2 and 3).

#### **I) Mill Creek**

The Consent Decree required that Mill Creek sediments be tested to determine if leachable and/or bioavailable contaminants, which may have originated at the Site, were present and could adversely impact aquatic organisms. This investigation was completed in 1992. Specific reaches of Mill Creek were identified for remediation.

Remediation consisted of removal of contaminated creek bottom sediment with an auger head dredge and cover of the east creek bank soil with clean material after removing the surficial soil layer. Creek bed sediments were sampled after dredging was completed in 1993 and found to contain metal contaminants above acceptable levels. Additional remedial action was taken to isolate contaminants under a minimum 4-inch gravel bed placed in the creek. Gravel placement was completed in 1994.

#### **J) East Drain**

The Consent Decree required that East Drain sediments be tested to determine if leachable and/or bioavailable contaminants which may have originated at the Site were present and could adversely impact aquatic organisms. Investigation results indicated that certain areas of the East Drain contained metals exceeding cleanup levels. Metal contaminants were also found in the relatively stagnant shallow groundwater zone between the East Drain and slurry wall during the investigation which was completed in 1992.

Remediation of East Drain sediments was undertaken in 1993 and included removal of sediments with a track excavator and front-end tire loader. Over 1,140 tons of sediment were shipped to the Waste Management Columbia Ridge Landfill, near Arlington, Oregon. Class A gravel borrow was used as backfill material in excavated areas.

Remedial action was taken to prevent contaminated groundwater from recontaminating the clean fill. An interceptor system between the Interurban trail and the East Drain was constructed

which included a well point extraction system was installed in late 1993. Well points were connected to the Western Processing extraction system and extraction/treatment.

The East Drain extraction system was operated for less than 3 years beginning in November 1994.

**K) Explanation of Significant Differences (ESD)**

After eight years of remediation (extraction, surface water infiltration, and treatment) to restore the site to clean conditions, the Trust submitted a Technical Impracticability Waiver (TIW) request, stating that the Site could not be cleaned in a reasonable time or at a reasonable cost. The Governments reviewed the TIW, but did not grant a waiver. The EPA issued an ESD, in December 1996, as a modification to the ROD to reflect site conditions and remediation. The objective of the remedial systems was changed from an aggressive effort to restore groundwater quality to acceptable levels within 5 to 7 years to containment of the contamination remaining on site and prevent further off-site migration. The Governments agreed that the modified remedy is fundamentally consistent with the selected remedy contained in the ROD and amended ROD and would remain protective of human health and the environment.

The ESD included the following alternative strategy:

1. Institutional controls,
2. Containment pumping inside the slurry wall and the trans plume,
3. RCRA consistent cap over the site,
4. Trans plume control,
5. Long-term monitoring and five-year reviews,
6. Isolation wall,
7. Hot spot remediation on-site using bioremediation, thermal reduction and stabilization,
8. Minimum of 30 years site maintenance, and
9. Contingency plan.

**POST ESD STATUS**

Although all components of the ESD have not yet been completed, work is ongoing. The following is a summary of progress to date.

1. *Institutional Controls.* Some institutional controls have been established. Passive controls include regulations, currently in effect, limiting groundwater use in the area.

Active controls include annual land use notifications, fencing, site security, and deed restrictions. All controls but deed restrictions are in effect. Long-term institutional controls will be addressed in a future Trust work plan.

2. *Containment Pumping.* A new extraction system (Figure 4) was installed in 1996 to provide more automated operation during the period of hydraulic containment for both on-site and off-site plumes. Fifteen new containment wells, 5 new monitoring wells, and 6 new piezometers were installed, completely replacing the old vacuum extraction system. Existing Sector 2 (a small area between the west slurry wall and Mill Creek) and Sector 3 (trans plume wells) were updated with new equipment. In late 1997, 2 new extraction wells were added to the system in Sector 4 (the area north of South 196<sup>th</sup> Street).

A new highly automated, computerized treatment system was constructed concurrently with the new extraction system for all groundwater extracted during containment operations and became operational in June 1997. The new system replaced the original system with a process designed to remove VOCs from Sector 1, 2, 3, and 4 groundwater. Treated water is discharged under permit to the King County sewage collection system. Off gas from the air stripper is carbon-treated prior to atmospheric release under a Puget Sound Air Pollution Control Agency (PSAPCA) permit.

The average extraction rate for the site has been approximately 230 gpm, based on annual averages from 1988 to 1997. The annual rate was reduced to 140 gpm in 1996 and 75 gpm in 1997. The extraction rate was reduced in conjunction with the change in focus to containment from restoration and because the reinfiltration of about 100 gpm of treated water was discontinued at the end of 1996.

The system is operational 7 days per week, 24 hours per day. From 1988 until 1996, the system has operated 97% of the time for a total of approximately 70,000 hours. The new extraction and treatment systems that became operational in 1997 have experienced similar operational efficiency.

3. *RCRA Cap.* The Trust has initiated work for the placement of a RCRA Cap over Area 1 (Figure 1) of the Site. Work plans and designs have been approved by the Governments. Work has begun at the Site in preparation for installation of the cap.

Since initiation of the first site inspection, over 300 wells, piezometers, and well points have been installed at Western Processing and in the surrounding area. Under the alternative strategy approved in the ESD, many old EPA wells, special purpose wells, piezometers, vacuum extraction wells, and infiltration lines were no longer required for extraction, infiltration, testing, or verification of containment. Between May and November 1997, approximately 300 of these "wells" were decommissioned by licensed drilling companies in accordance with Washington State regulations.

In addition, work was initiated for the removal/disposal of formerly used buildings and equipment. Contaminated materials were disposed off site at a secure landfill in Arlington, Oregon. Cleaner soils were stored on site in preparation for stabilization and future use as fill beneath the proposed RCRA Cap.

4. *Trans Plume Control.* Ongoing groundwater level monitoring and analysis of groundwater samples from within and around the trans plume indicates that pumping continues to meet the ESD objective for containment of the plume.
5. *Long-Term Monitoring and Five-Year Reviews.* The Trust is preparing a long-term monitoring and sampling plan for the Site. The first draft is expected in 1998. This document is the second five-year review for Western Processing. Additional reviews are planned.
6. *Isolation Wall.* The ESD retains the slurry wall concept and includes construction of a supplemental isolation wall immediately south of the South 196<sup>th</sup> Street right-of-way. This will continue to protect Mill Creek and the East Drain from remaining site contamination in Area I and should further reduce the groundwater pumping necessary to maintain containment.

With the isolation wall, the area north of South 196<sup>th</sup> Street, formerly called Cell 7 and now known as Sector 4, has been segregated from the remaining areas of contamination. Because of the isolation wall and low levels of contamination currently found in Sector 4, a RCRA-type cap was not required.

The isolation wall was constructed using a soil-cement-bentonite backfill material. The mix varies from the original slurry wall mix to ensure additional structural stability required to facilitate plans by the City of Kent to construct an embankment across the Site at the South 196<sup>th</sup> Street corridor for a major east-west arterial.

7. *"Hot Spot" Remediation.* The ESD required treatment of an additional 5,000 cubic yards of contaminated soil. Soil samples were collected and analyzed from two depths at 39 locations. The boundaries of the "hot spot" were determined through an iterative process designed to identify the 5,000 cubic yards of the most contaminated (generally chlorinated VOCs >10 mg/kg, aromatic VOCs >20 mg/kg, total petroleum hydrocarbons [TPH] >10,000 mg/kg, and metals >25,000 mg/kg) soil using contour and risk-enhanced contour plots. Soils were excavated from the "hot spot," and 5761 cubic yards (8983 tons) of contaminated soil were shipped to the hazardous waste disposal facility in Arlington, Oregon. This cleanup method was chosen as being the best alternative to the original concept of desorption and stabilization. The excavation was backfilled with lifts of clean gravel and crushed rock. Activities began with issuance of a work plan in March 1997 and were completed with regrading of surface soils in October 1997.

*Bioremediation.* The ESD identified bioremediation as a possible cleanup alternative for both shallow and deep groundwater VOC contamination. Field tests indicated that ongoing natural processes (intrinsic bioremediation) would not be significantly enhanced by active remediation. Since there was no technical advantage or cost effectiveness, bioremediation was removed from active consideration as a cleanup option.

8. *Site Maintenance.* The Trust currently maintains the Site in accordance with various existing work plans. Long-term maintenance and operations will be addressed in the long-term site operations and maintenance plan currently under development by the Trust.
9. *Contingency Plan.* The Interim Period Contingency Plan identifies procedures for evaluating containment and actions to be taken if those procedures indicate a loss of containment. This plan will be replaced by a final contingency plan to be issued for the period following capping of the Site.

#### IV. CURRENT STATUS

Active remediation of the Site is continuing. On- and off-site surface remediation and subsurface waste removals have been completed. The current focus of work at the Site includes:

1. Ongoing operation and maintenance (O & M) of the new extraction/treatment system is expected to continue for at least 30 years (unless the period is modified) after completion of the Site cap.
2. Ongoing decommissioning and demobilization of buildings and equipment no longer required to meet ROD objectives is in progress.
3. Initiation and completion of Site work related to RCRA cap construction during 1998 and 1999 began as of 7/30/98.
4. Sector 4 was isolated from the remainder of the site by the installation of the isolation wall. Groundwater in Sector 4 is monitored to verify hydraulic containment, extracted and treated, and tested for groundwater quality.
5. Spoils from isolation wall construction and Mill Creek/East Drain sediments will be moisture stabilized and moved to Sector 1 for use as subgrade material beneath the planned RCRA cap.
6. Grading and berms are in place and control stormwater runoff across the entire site.
7. O & M at the site is ongoing in accordance with Governments approved work plans.

8. Groundwater level monitoring and sampling and analysis are ongoing in accordance with the approved interim period monitoring plan.
9. The Site interim monitoring plan has been implemented and includes regularly scheduled collection of site characterization (background groundwater levels and quality, surface water and sediment quality), operational (treatment plant influent and effluent water quality and flow rates), and environmental (groundwater quality and levels, surface water quality) data. The interim plan will be replaced by a final plan as noted earlier.
10. Surface water criteria in Mill Creek were achieved by mid-1990. A review of data collected through the 3<sup>rd</sup> quarter 1997 indicate variable background contaminant concentrations in Mill Creek surface water, but no site related impacts to the creek. Mill Creek and East Drain sediments have been cleaned up.
11. Concentrations of cis-1,2-dichloroethene have decreased in the three trans wells from above 2,000 ug/l in 1988 to less than 70 ug/L as of July 1997, a greater than 95% reduction.
12. Monitoring well data from on-site wells show contaminant concentrations for trichloroethene, vinyl chloride, and zinc decreased site-wide by two orders of magnitude from 1988 to 1995. The maximum concentrations of contaminants detected in extraction/treatment system wells during the June 1997 sampling event were: zinc (4,370 µg/L), cadmium (24.3 µg/L), cis-1,2-dichloroethene (3,690 µg/L), vinyl chloride (842 µg/L), and trichloroethene (1,300 µg/L).
13. Site-wide average groundwater contaminant concentrations measured in June 1998 for treatment system influent during June 1998 were: zinc (117 µg/l), cadmium (non-detect at 5 µg/l), cis-1,2-dichloroethene (370 µg/l), vinyl chloride (210 µg/l), and trichloroethene (71 µg/l).
14. Figure 5 shows the contaminant removal rate in pounds per day for the extraction/treatment systems from 1988 through 1996. This figure includes combined removal rates for total metals and total VOCs. The extraction rate decreased to less than 20 lbs/day within 3 years; and, since then, has remained below 20 lbs/day. A total of 102,000 lbs of contaminants were removed during the initial eight years of operation.
15. The spread of contamination has been prevented by the maintenance of inward gradients within the containment system.
16. The on-site OHM laboratory was decommissioned in early 1998. Site samples are currently shipped to Columbia Analytical Services in Kelso, Washington. Data validation of laboratory data is completed by EcoChem of Seattle, Washington.
17. The QA/QC program used throughout the remedial action met the EPA and the State of Washington requirements. All monitoring was performed using EPA-approved methods, and the vendor did not note any exceptions to the QA/QC protocols.

18. All costs for investigation, design construction and operation of the treatment system at this site were borne by the Trust. The following is a Trust-generated forecast of the costs it will incur to fund the project through long-term monitoring (30 years for estimation purposes) after completion of the Site cap.

Subsurface test program (completed May 1987)	\$3,620,300
Subsurface remediation and O & M (extraction/treatment)	\$71,579,000
Technical consultants	\$13,652,700
Past response and oversight (complete in 1994)	\$5,952,800
Special master, Puget Sound Power, bank fees, misc.	\$311,400
Independent CPA	\$184,600
Long-term monitoring	\$14,348,600
Alternative (ESD) strategy projects	<u>\$10,793,900</u>

TOTAL -- \$120,443,300

## V. SUMMARY OF THE FIVE-YEAR REVIEW

Activities in this Five-Year Review consisted of:

1. Review of site-related documents and agreements;
2. Review of monitoring data;
3. Site visit and inspection (the most recent site visits occurred on July 8, and 22, 1998, and included a site walk-through with EPA, WDOE, and Trust personnel);
4. Community relations activities (e.g., fact sheets were issued after the ESD and at the onset of the 1998 construction season); and
5. Preparation of this Five-Year Report.

A timeline for major events performed during this remedial project is shown below.

<u>Date</u>	<u>Activity</u>
7/83	Site closed by court order
7/83	Emergency removal of site wastes
9/83	Site placed on NPL
11/84	Surface Cleanup
3/85	RI/FS released
9/85	Record of Decision issued
9/86	Amended Record of Decision issued
4/87	Consent Decree entered by the Court
4/87	Subsurface remediation begun
10/88	Operations for both P&T systems begun
10/88	Slurry wall constructed around the site
3/90	Three-Year performance standards achieved for Mill Creek
8/93	Mill Creek restoration
11/94	East Drain extraction system installed
9/95	TI Waiver Petition submitted
12/95	ESD issued in response to TI Waiver Petition
6/96	Containment wells installed
1/97	Containment pumping phased into operation
6/97	New treatment system started
10/97	Isolation wall installed
10/97	Final on-site subsurface waste removal
10/98	Anticipated completion date for Sector 4 work
10/99	Anticipated RCRA Cap completion date

## **VI. PROGRESS TOWARD REMEDIAL OBJECTIVES**

The following summarizes remedial objectives achievements and work ongoing to meet these objectives:

1. The first ten items identified as components of the ROD (Section III e) have been successfully completed;
2. The on-site surface removal action was successfully completed prior to 1985;
3. Subsurface soil and waste cleanup was completed in 1997 with the excavation and offsite disposal of contaminated soil from Area 1;
4. Offsite soils have been removed and clean fill placed in excavated areas;
5. A groundwater extraction and treatment system has been in operation since 1988;
6. Mill Creek and East Drain cleanups have been completed;



7. Mill Creek compliance criteria continue to be met;
8. Stormwater controls remain in place; and
9. Plans have been submitted for construction of a RCRA cap over Sector 1 and preliminary construction activities begun as of 7/30/98.

## VII. DOCUMENTS REVIEWED FOR THIS REPORT

1. Hydrogeological Assessment, Final Report, Hart Crowser and Associates, Inc., October 1984.
2. *Remedial Action Plan Phase II: Subsurface Cleanup*, Landau Associates, Inc., September 1984.
3. *Record of Decision*, U.S. Environmental Protection Agency, September 1985.
4. *Schedule Work Plan*, Chemical Waste Management, Inc., December 1987.
5. *Quarterly Interpretive Report, 4<sup>th</sup> Quarter, 1993*, Landau Associates, Inc., April 1994.
6. *Remedial Action Report. Installation of Extraction Wells 5U1 A, 5U2A, 1U3A, 1U4A, 1U5A, 1 U6A and Well Points*, Landau Associates Inc., May 24, 1994.
7. *Technical Impracticably Waiver Petition*, Landau Associates, Inc., September 12, 1995.
8. *Technical Impracticably Waiver Petition, Western Processing (Appendices)*, Landau Associates, Inc., September 12, 1995.
9. *1995 Annual Evaluation, Western Processing*, Landau Associates, Inc., May 14, 1997.
10. Copy of Western Processing *Consent Decree*, filed April 10, 1987.
11. *Explanation of Significant Differences, Western Processing Superfund Site*, U.S. Environmental Protection Agency, December 11, 1995.
12. Correspondence with Paul Johansen and Bill Enkeboll, July 8, 1997.
13. *1991 Annual Evaluation*, Landau Associates, Inc., August 5, 1992.
14. *Quarterly Interpretive Report, 3<sup>rd</sup> Quarter, 1996*, Landau Associates, Inc., April 2, 1997.
15. *Groundwater Remedial Cost Analysis*, U.S. Environmental Protection Agency.

16. *Monthly Summary, Waste Water Discharge Report for June 1998, Western Processing Superfund Site, Boeing, July 10, 1998.*
17. Quarterly Interpretive Report, 2<sup>nd</sup> Quarter 1997, Landau Associates, Inc., July 6, 1998.
18. Amended Record of Decision, U.S. Environmental Protection Agency, September 1986.
19. Western Processing Data Report, Third Quarter, 1997, Ecology and Environment, Inc., July 28, 1998.
20. Remedial Action Report, Shallow Soil Hot Spot, OHM Corp., February 4, 1998.
21. Remedial Action Report, Decommissioning/Demobilization, Well Abandonment 1997, OHM Corp., March 17, 1998.
22. Cell 7 Isolation Wall Construction Report, Landau Associates, Inc., February 2, 1998.
23. Bioremediation Field Studies Summary Report, Landau Associates, Inc., July 11, 1995.
24. Feasibility Study for Subsurface Cleanup, EPA 37.OL16.2, March 6, 1985.
25. Interim Period Site Monitoring, Revised Work Plan, Landau Associates, Inc., January 8, 1998.
26. Sector 4 Comprehensive Work Plan, Draft, Landau Associates, Inc., May 20, 1998.
27. Site Cap and S. 196<sup>th</sup> St. Embankment, Basis of Design, 90 Percent Design, Landau Associates, Inc., June 8, 1998.
28. Site Cap Construction Stormwater Pollution Prevention Plan, Draft, Landau Associates, Inc., May 6, 1998.
29. Proposed S. 196<sup>th</sup> Street Embankment, Draft Design Report, Landau Associates, Inc., May 12, 1998.
30. Supplementary Remedial Investigation Report, EPA No. 37-OL16.2, July 1986.
31. Remedial Investigation Data Report, EPA WA37-OL16.1, December 1984.
32. Cell 7 Containment Extraction Wells and Piezometers Installation Report, Landau Associates, Inc., November 26, 1997.
33. Remedial Action Report, Mill Creek Gravel Cover, Chemical Waste Management, Inc., November 3, 1994.
34. Remedial Action Report, East Drain Interceptor System, Chemical Waste Management, Inc., March 1, 1995.

35. Superfund Site Interim Close Out Report, Western Processing, USEPA, December 1991.
36. Further Contingent Actions Sector 4 Outward Gradients, Technical Memorandum, Landau Associates, Inc., January 30, 1998.
37. Interim Period Contingency Plan, Landau Associates, Inc., August 14, 1996.
38. Summary of N-Wells Installation and Physical Chemical Test Results Report, Landau Associates, Inc., May 2, 1994.
39. Placement of Off-Property Covers, Chemical Waste Management, September 22, 1989.
40. Western Processing Phase II Remediation Status Report, Trust, November 1997.

## VIII. SITE CONDITIONS

Comments are based on observations made during routine on-going on-site meetings; the 15<sup>th</sup> biweekly meeting of 1998 took place on July 22, 1998:

1. The Western Processing site remains fenced with access controlled by on-site personnel;
2. The Site and trans plume groundwater extraction system has operated continuously with only very brief shut-downs for routine maintenance;
3. The treatment plant has operated continuously with only very brief shut-downs for routine maintenance;
4. Ongoing activities related to well/piezometer abandonment and decommissioning/demobilization of surplus buildings and equipment is proceeding as planned;
5. Work has been initiated in preparation for installation of a RCRA cap at the site;
6. New wells and piezometers have been installed to replace damaged or aging wells/piezometers required for continued Site monitoring; and
7. Work is ongoing to complete all active work in Sector 4, prior to establishing a passive treatment program north of South 196<sup>th</sup> Street.

## IX. CLEANUP GOAL ATTAINMENT

### A) Cleanup Goals/Standards

As determined by the Consent Decree, the following cleanup goals were established:

1. *Surface water quality goals for Mill Creek (adjacent to site) are Federal Ambient Water Quality Criteria (AWQC) or background-derived concentrations where upstream concentrations approach or exceed the AWQC. These goals are applied at designated downstream sampling points. The Consent Decree required that these goals be met within three years.*

Surface water quality goals for Mill Creek were attained in 1990.

2. *Prior to remediation, shallow groundwater from the Site discharged to Mill Creek. The surface water requirements were a means of measuring cleanup within shallow groundwater beneath the site. There were no other on-site cleanup goals set for the shallow groundwater. Trans plume groundwater performance standards established in the Consent Decree are the RMCLs for cis- and trans-1,2-dichloroethene, 70 ug/l in the B Zone. These standards only apply to the trans plume identified at the time of the Consent Decree and do not apply to all offsite areas.*

Groundwater monitoring indicates that the trans plume is being captured by ongoing extraction; and while concentrations of cis-1,2-dichloroethene measured in "trans" plume extraction wells have decreased to less than 70 ug/l (based on 2<sup>nd</sup> quarter 1997 data), concentrations measured in other plume monitoring wells indicate the area is not yet within Amended ROD compliance criteria (70ug/l).

3. *The ESD, issued in 1995, did not waive, modify, or add any performance standards to the amended ROD; it did specifically identify a requirement for revisiting the issue of setting additional standards for vinyl chloride in the "trans" plume during five-year reviews.*

Intrinsic (natural) bioremediation of cis-1,2-dichloroethene is ongoing. Vinyl chloride is a naturally occurring breakdown product of cis-1,2-dichloroethene. In turn, vinyl chloride ultimately biodegrades into carbon dioxide and water. The decrease in cis-1,2-dichloroethene concentration has been accompanied by the expected increase in vinyl chloride levels in the "trans" plume. Sampling and analysis have shown that ongoing extraction and treatment has resulted in containment of both these VOCs within the plume. Because the process of biodegradation is ongoing and containment has been documented, the Governments have chosen to postpone establishing a performance standard until the next five-year review, at which time additional data on both these contaminants will be available.

## **B) Performance Goals**

As determined by the Consent Decree, the following treatment performance goals have been established:

1. *Achievement of an inward flow of shallow groundwater (<40 ft bgs) within a specified area of the site. This area is approximately defined by the property boundaries (see Figure 1). Achievement of either: 1) a reversal of groundwater flow for Zone B at a depth of 40 to 70 feet at the western boundary of the site; or 2) establishment of a hydraulic barrier to regional groundwater flow at the 40- to 70-foot depth at the western boundary of the site.*

An inward flow of groundwater across the slurry wall and into the trans plume, and up from Zone B to Zone A within the slurry wall has been achieved.

2. *All air emissions must comply with a discharge permit issued from the Puget Sound Air Pollution Control Agency.*

Discharge requirements established by air emission permits have been met consistently by treatments systems on site.

3. *Combined wastewater effluent from the treatment systems must meet discharge criteria included in the POTW discharge permit.*

Discharge requirements established by the wastewater discharge permits have been met consistently by treatments systems on site.

## **X. RECOMMENDATIONS**

The slurry wall and extraction/treatment systems have been effective in containing groundwater contamination and been protective of Mill Creek. Continued operation is required to maintain containment.

The current effort to place a RCRA consistent cap over much of the site due to be completed in the Fall of 1999 should enhance the ability of the system to maintain containment. The cap will reduce infiltration and eliminate other exposure pathways (e.g., direct contact).

Additional standards for other contaminants, such as vinyl chloride, are not necessary at this time. The success of current remedial actions and expectation for continued containment, extraction, and treatment indicate the remedy is protective of public health and the environment. The question of additional performance standards should be addressed during the next five-year review. Potential future land use(s) and the institutional controls that are necessary to allow for such use(s) should be evaluated at the site. The City of Kent's plan to construct a highway through the site should continue to be evaluated in order to ensure that there is no interference with existing and future cleanup activities and that exposure to contamination at the site will be prevented.

Long-term monitoring and O & M are required. Plans are currently in preparation for submission to the Governments. Regular on-site oversight by the Governments is expected to continue at least into the year 2000. In addition to quarterly data evaluations, regular (e.g., 5-year) reviews should be established following demobilization from the site of all personnel and operations except those identified in the long-term monitoring and O & M plans.

## **XI. NEXT REVIEW**

The next Five-Year Review will be conducted within five years of this review.

## **XII. STATEMENT OF PROTECTIVENESS**

I certify that the remedy selected for this site remains protective of public health and the environment. The current remedy is expected to meet the cleanup goals in the ROD, amended ROD, and ESD. Continued evaluation of the site will be maintained to assure continued protectiveness.

Date: \_\_\_\_\_

\_\_\_\_\_  
Randall F. Smith, Director  
Office of Environmental Cleanup  
U.S. EPA Region X